Working Paper

Nominal Wage Change: An Indicator of Labor Supply

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Abstract
Highlighted in this research are the challenges faced by analysts in conducting labor supply-demand analysis and a proposed new analytical tool that can be used as an indicator of labor shortages in a particular labor market. The indicator of labor supply shortages has proven useful in identifying industries that experienced labor shortages in the 1990s and reflects many aspects of the California economy and labor markets. Data on annual wages and employment from the Quarterly Census of Employment and Wages program (QCEW) are used to develop the methodological framework.

Introduction

Labor economists have long studied the labor supply response to changes in economic opportunities caused by business cycles, migration, and long-term demographic trends. Interactions among these socioeconomic forces, at both national and transnational levels, make predicting demand for and supply of labor a complex and daunting task. While it is relatively easy to construct measures of derived demand for labor (based on the demand for goods and services in a given market economy), developing measures of labor supply is much more complex due to several factors, including the variation in skill levels required by different industrial sectors, the dynamic nature of labor markets, cost efficiency pressures, and inherent time lags between the increased demand for labor, as indicated by higher wages, and the responsiveness of the labor market to the same. In the absence of direct and/or reliable measures of labor shortage or surplus, labor analysts across the nation are periodically challenged with questions related to identifying the conditions that will help understand the labor market-clearing mechanisms, specifically in the context of wage movements. According to economic theory, as demand for goods and services increases relative to supply, prices should rise. Applying this logic to the labor market, if the demand for labor increases more rapidly relative to supply, wages should rise, supply of workers should increase depending upon the responsiveness of labor markets[1] to increased wages, and the labor market should clear at an equilibrium wage where workers demanded are equal to workers supplied.

Generally, during an economic boom employers face difficulties finding workers who are qualified, available, and willing to work at the prevailing wage or salary, while during an economic recession workers possessing the same skills and education experience layoffs and many remain unemployed for extended periods of time. This translates into labor shortages during "good" economic times and labor surpluses during "bad" economic times, at least for some industries. For example, during the economic

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[1]Also termed as the elasticity of labor supply; it relates to the percentage change in labor; say in hours work, associated with percent change in the wage rate. When the labor supply elasticity is less than one in absolute value, the labor supply curve is said to be inelastic, meaning there is relatively little change in hours of work for a given change in the wage rate. In contrast, a value greater than one would indicate that hours of work are greatly affected by the change in the wage rate and the labor supply curve would be considered elastic.

expansion of the 1990s, the United States economy created millions of new jobs, resulting in unprecedented low unemployment rates, particularly during the last three years when unemployment rates dipped below 2 percent in some states. Industries such as high technology and health care have reported difficulty in finding qualified workers and have experienced increased wage and salary costs as a result of their efforts to attract qualified workers. Individual workers in these industries typically earned higher wages and received relatively attractive benefit packages. In contrast, due to the economic slowdown in 2001, a large number of highly skilled and educated workers, especially in high technology industries became unemployed and desperately sought job opportunities for longer periods of time.

Labor shortages can be short-term or long-term. Short-term labor shortages are most likely to occur when overall unemployment is at the frictional[2] level, a level when most workers are able to find suitable jobs at prevailing wages and benefits. Employers are put in the position of attracting workers from other employers by offering higher wages and enhanced benefit packages. Conversely, these shortages diminish when there is structural unemployment[3] and employers are more likely to find qualified workers who will accept prevailing industry wage and benefit packages. Nevertheless, some industries report a long-term labor shortage problem. For instance, the California health care industry has been facing a severe shortage of health care professionals for the last decade or so. Finally, long-term labor shortages often have a demographic component. Examples of relevant components include a shrinking number of live births, declining labor force participation, and an aging population.

Given this background, the purpose of this research is to investigate whether the longitudinal patterns revealed by employment and annual earnings at the industry level can be used as an indicator of a labor shortage and whether the responsiveness of the labor market to such a shortage could be studied. The economic premise of the study is that relatively high wage increases are an indicator of labor shortages. More specifically, the objective is to develop a methodological framework to construct an indicator of labor shortage or surplus in a given industry.

Background and Methodological Framework

State labor market information centers across the nation produce wage data in a variety of forms. One form is *annual wages* from the QCEW, also known as the ES-202, sponsored by the U.S. Bureau of Labor Statistics (BLS). The BLS publishes an annual compendium of national and State industry data in the bulletin titled, Employment and Wages, Annual Averages.

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[2] Also known as 'search unemployment,' this is the amount of unemployment that corresponds to job vacancies in the same labor market because it takes time to match workers and jobs and, as a result, unemployment and unfilled vacancies can exist side by side.

[3] Unemployment due to fundamental changes taking place in the economy, such as the decline of some industries and the rise of others. Eliminating this type of unemployment may require retraining of workers who are well suited to the needs of new and emerging industries.

The editions from 1989 through 1999 contain consistent data by detailed industry showing average annual employment and annual wages by Standard Industrial Classification (SIC). An *average wage* figure for each industry can be computed by dividing the total annual wages by average annual employment. The change in this computed average wage is being posed in this paper as a basis for computing a measure of labor supply in order to gauge shortages or surpluses. The change is interpreted in the context of the change for each industry division. For example, the change in annual wages for each Construction subindustry is compared to the change in annual average wages for the entire construction industry, and so forth for each major industry division. This examination of available data is meant to explore the potential for enhancing labor supply-demand analysis. Other economic conditions may well cause unusual relative increases in the annual wage, for example, the tendency of employees in numerous industries to cash out stock options. Such developments may distort the analysis underlying this paper.

The supply indicator developed in this paper is based on the following theoretical economic framework:

1. The greater the difference between the annual wage-change of any particular subindustry (4-digit industry level) and the average wage-change of the entire industry group (division level industry), the more intense or significant will be the labor shortage.
2. The greater the size of the industry with the shortage, the more significant will be the shortages.

Based on the above framework, the *supply indicator* is defined as "the product of the employment level and wage change between two time periods." For the purposes of this paper, the following equation was used to develop a scenario using data for 1996 and 1999:

$$\mathbf{SI_j} = (WC_{j,96,99} - WC_{D,96,99}) * (EMPL_{j,96})$$

Where

$\mathbf{SI_j}$ is the value of the supply indicator for industry "j"
$\mathbf{WC_{j,96,99}}$ is the percentage change in average wages in industry "j" from 1996 to 1999
$\mathbf{WC_{D,96,99}}$ is the percentage change in average wages in major division "D" from 1996 to 1999
$\mathbf{EMPL_{j,96}}$ is the employment level for industry "j" in 1996

Multiplying the wage change indicator by average annual employment in the base year (1996) has an advantage over a measure based simply on wage change, in that it minimizes distortion resulting from the presence of small industries. Although this analysis focuses on the applications of SI_j to the issues relating to labor shortages only,

further exploration might be warranted into the idea that negative values for this indicator may suggest labor surpluses[4].

Supply Indicators (SI) were calculated using equations 1 and industries at the 4-digit SIC level were ranked in descending order based on the absolute value of the SI, and the one hundred highest-ranking industries were selected for the purpose of this analysis. Selecting the top 100 industries out of more than 900 industries enabled us to focus on industries with a more significant labor market effect. Detailed data for all 100 selected industries are presented in this report.

Findings and Analysis

The findings, shown by major industry division below, across the major industry divisions seem consistent with much common knowledge or speculation about specific labor shortages. For example, the perennial claims of shortages of raisin grape workers and highly skilled workers in computer-related industries in Manufacturing, Trade and Services are no surprise. Media reports of labor shortages in several health care industries are also well known. Other industries with shortages suggested by the supply indicator are broadly consistent with common consensus and come as no surprise, given the economic boom of 1990s and its attendant electric power usage, biomedical and E-Commerce developments, and increased investment activity in the following industries:

- Natural Gas in Mining;
- Electrical and Carpentry work in Construction;
- Pharmaceuticals in Manufacturing
- Drugs in Wholesale and Retail Trade;
- New and Used Car Dealers in Retail Trade;
- Telephone Communications;
- National Commercial Banks in Finance, Insurance & Real Estate (FIRE)

The analytical value of examining the indicator developed in this paper lies, first, in identifying industries that may have experienced shortages in the recent past and then observing the rate of change for both employment and wages, which indicates the labor market's responsiveness to increased wages for different industries. For example, when focusing on prepackaged software services (SIC 7372), one observes that while the annual percentage change in employment was roughly the same between 1996-99 and 1997-99 (11 and 10percent respectively). The annual wage change between 1996-99 was much lower than the change occurring between 1997-99 (17 and 22percent respectively). Further year-to-year analysis shows that while the wages grew by 19

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[4] Two other methodological points are important. First, the BLS Bulletins display arithmetic means, whereas medians might be more appropriate as they are less subject to extreme values. Second, wage data were not adjusted for inflation. Although such an adjustment would reduce the percentage change in average wages, it is not expected to change the underlying relationships and general trends between industries.

percent between 1996 and 1997, wages posted a 28 percent growth between 1997 and 1998, with the corresponding employment growth of 13 and 11 percent respectively. The employment and wages changed by 7 and 34 percent respectively between 1998 and 1999, indicating a relatively low elasticity of supply for this labor market. Based on this analysis, it appears that the methodology would be useful, first, in identifying industries based on the absolute values of SI within each division, and, second, in conducting a dynamic analysis of these industries. This will help analysts understand the lead and lag relationships between wages and employment for targeted industries.

Agriculture and Mining

While the agricultural labor market in California is the biggest and one of the most complex in the nation, mining is a declining labor demand industry (the one sub-mining industry picked by the supply indicator accounts for almost 12 percent of employment in Mining).

The factors that make the agricultural labor market highly dynamic and complex include the seasonal nature of farming, fluctuations in the demand for farm labor at the local level, the predominance of an international workforce, and the geographic mobility of farm workers within the State. While the production of labor-intensive fruit, vegetable and horticultural specialty crops in California increased in the 1990s, the average employment (on a year round basis) of farm workers either rose slightly or stayed stagnant. Yet the farmers, more particularly, vegetables and melons (SIC 016) and fruits and tree nuts (SIC 017) growers, have reported labor shortages during harvest season.

Table A: Agriculture, Forestry & Fisheries

SIC	SIC Title	Empl-1996	Empl-1999	Average Wage1999	Wage Change 1996-99	SI 96-99
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
0100	Agriculture, Forestry & Fisheries	495,607	508,023	$18,060	21.5%	
0171	Berry crops	18,403	17,812	$16,905	33.9%	2,286
0191	General farms, primarily crop	29,972	25,375	$18,170	24.2%	811
0761	Farm labor contractors	115,722	113,023	$10,585	38.4%	19,589
0762	Farm management services	11,206	9,003	$22,147	35.2%	1,534

Table B: Mining

SIC	SIC Title	Empl-1996	Empl-1999	Average Wage1999	Wage Change 1996-99	SI 96-99
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
1000	Mining	28,780	23,244	$66,061	21.8%	
1442	Construction sand and gravel	2,949	2,718	$65,798	51.1%	863

Four agricultural subindustries identified by the supply indicator accounted for almost 33 percent of employment in the Agriculture, Forestry and Fisheries sector. According to SI analysis, the four major categories that experienced labor shortage were vegetables and melons, berry crops, farm labor and management services, farm labor contractors and general farms, primarily crops. By far the largest industry is farm labor contractors (FLC), and these data are consistent with the growing trend of the last decade for

farmers to use the services of FLCs. Two recent studies by EDD and University of California at Davis reveal that the major change in the farm labor markets in the 1990s was the rising share of workers reported by FLCs[5].

Construction

Ten sub-construction industries highlighted by SI accounted for 56 percent of employment in Construction. The electrical work industry encompasses cable TV hookups, communication equipment installation, as well as intercommunications equipment and telecommunications equipment installation. The 39 percent employment increase in these types of businesses, as compared to 34 percent for all construction between 1996 and 1999, is certainly consistent with socio-economic trends of the 1990s, in part represented by the growth of the Internet. That wages would increase in these businesses more rapidly than in other construction businesses also seems consistent with the underlying economic premise of this paper.

Table C: Construction

SIC	SIC Title	Empl-1996	Empl-1999	Average Wage1999	Wage Change 1996-99	SI 96-99
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
1500	Construction	504,237	678,323	$37,523	15.0%	
1521	Single-family housing construction	72,721	100,883	$34,445	19.6%	3,338
1531	Operative builders	1,878	2,974	$70,997	36.2%	398
1542	Nonresidential construction, nec	34,668	45,018	$49,145	16.2%	436
1622	Bridge, tunnel, & elevated highway	5,932	6,681	$61,876	25.4%	621
1731	Electrical work	57,685	79,946	$42,632	16.5%	880
1751	Carpentry work	20,723	34,170	$27,902	17.2%	466
1761	Roofing, siding, & sheet metal work	24,612	28,105	$28,576	20.5%	1,353
1771	Concrete work	27,994	36,608	$34,459	21.7%	1,880
1793	Glass and glazing work	4,405	6,064	$40,275	29.1%	620
1799	Special trade contractors, nec	26,589	37,471	$31,853	20.4%	1,452

Manufacturing

Nineteen sub-manufacturing industries account for almost 26 percent of employment in manufacturing. High technology manufacturing is evident in all 19 subindustries, the largest in terms of the supply indicator being electronic computers, semiconductors and related devices, and pharmaceutical preparations. Also large in terms of employment levels is radio and TV communications equipment manufacturing. This industry undoubtedly shows significant increases in employment and average wages because of the increased demand for equipment produced by this industry. The pharmaceutical preparations industry shows a large relative employment increase along with a large wage increase, undoubtedly reflecting the biomedical developments of the last decade.

Table D: Manufacturing

SIC	SIC Title	Empl-1996	Empl-1999	Average	Wage	SI 96-99

[5] (a) http://californiaagriculture.ucop.edu/0401JFM/pdfs/ag_labor.pdf
   (b) http://www.calmis.ca.gov/specialreports/ag-emp-1991to2001.pdf

				Wage1999	Change 1996-99	
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
2000	Manufacturing	1,830,147	1,915,436	$49,672	24.5%	
2329	Men's & boys' clothing, nec	3,654	3,696	$26,144	39.0%	531
2361	Girls' & children's dresses, blouse	1,949	1,332	$34,286	46.8%	434
2834	Pharmaceutical preparations	19,520	25,541	$91,617	67.4%	8,373
3511	Turbines and turbine generator sets	3,711	5,040	$59,600	44.2%	731
3541	Machine tools, metal cutting types	2,305	3,760	$55,640	53.5%	669
3559	Special industry machinery, nec	15,770	13,212	$108,659	77.6%	8,370
3571	Electronic computers	52,367	60,892	$146,973	99.5%	39,247
3577	Computer peripheral equipment, nec	16,350	16,285	$79,512	40.0%	2,531
3652	Prerecorded records and tapes	4,825	4,137	$66,384	63.7%	1,891
3661	Telephone and telegraph apparatus	16,378	16,780	$86,107	33.8%	1,525
3663	Radio & TV communications equipment	15,697	18,558	$68,494	30.4%	928
3674	Semiconductors and related devices	62,878	71,732	$101,362	51.9%	17,210
3679	Electronic components, nec	31,245	32,494	$55,815	35.6%	3,466
3699	Electrical equipment & supplies, nec	4,242	4,084	$100,801	115.9%	3,877
3825	Instruments to measure electricity	32,307	28,244	$94,302	35.7%	3,606
3827	Optical instruments and lenses	4,897	7,844	$84,822	51.4%	1,316
3829	Measuring & controlling devices, nec	5,714	4,003	$51,283	39.2%	842
3845	Electromedical equipment	8,753	11,299	$72,025	29.3%	417
3851	Ophthalmic goods	5,220	5,856	$49,471	47.4%	1,194

Transportation, Communication & Public Utilities (TCU)

Five sub-TCU industries picked by SI from this sector account for over 10 percent of employment in TCU. Demand for workers in radiotelephone (cellular) and cable services has clearly been reflected in rapid employment growth in these industries and high relative wage increases to help meet that demand. This speaks to a labor shortage. The TCU industry as a whole grew by 13 per cent in employment between 1996 and 1999, whereas these two industries grew by 77 percent, and 24 percent. The wages in these two industries grew by 195 percent and 38 percent, respectively, as compared to the sector level wage change of 21 percent.

Table E: Transportation, Communications, and Public Utilities

SIC	SIC Title	Empl-1996	Empl-1999	Average Wage1999	Wage Change 1996-99	SI 96-99
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
4000	Transportation, Communications & Utilities	625,593	705,538	$46,480	20.7%	
4499	Water transportation services, nec	1,827	1,831	$40,872	60.8%	732
4812	Radiotelephone communications	16,784	29,523	$134,814	194.6%	29,197
4822	Telegraph & other communications	1,332	1,213	$95,160	68.4%	636
4832	Radio broadcasting stations	9,729	10,695	$51,814	31.5%	1,055
4841	Cable and other pay TV services	18,647	23,053	$53,845	38.3%	3,292

Wholesale Trade

The ten sub-wholesale trade industries account for over 15 percent of employment in wholesale trade. Again, this division reflects the same developments in computers and pharmaceuticals as we have seen in the previous divisions.

Table F: Wholesale Trade

SIC	SIC Title	Empl-1996	Empl-1999	Average Wage1999	Wage Change 1996-99	SI 96-99
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
5000	Wholesale Trade	746,093	809,260	$45,785	16.1%	
5045	Computers, peripherals & software	49,069	65,720	$70,964	26.1%	4,890
5065	Electronic parts and equipment	49,393	50,086	$72,284	22.1%	2,964
5112	Stationery and office supplies	11,989	10,417	$34,201	21.3%	616
5122	Drugs, proprietaries, and sundries	23,292	26,524	$63,644	25.3%	2,141
5136	Men's and boys' clothing	7,841	7,742	$40,392	34.0%	1,405
5145	Confectionery	5,890	6,189	$34,825	23.6%	439
5146	Fish and seafood	5,132	4,929	$33,008	26.0%	508
5172	Petroleum products, nec	6,410	8,123	$51,406	27.0%	700
5182	Wine and distilled beverages	6,674	6,843	$55,239	24.2%	542
5199	Nondurable goods, nec	35,039	41,579	$36,096	18.7%	908

Retail Trade

The 10 sub-retail trade industries account for over 45 percent of employment in Retail Trade. Computer software stores, certain clothing stores, and catalog and mail order houses increases most likely reflect greater spending by the general public on these items during a booming economy. The increased consumer demand creates pressure on retail businesses to hire more workers, and to attract them from other industries by offering higher relative wages, as evident in Table G below.

Table G: Retail Trade

SIC	SIC Title	Empl-1996	Empl-1999	Average Wage1999	Wage Change 1996-99	SI 96-99
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
5200	Retail Trade	2,226,189	2,386,021	$20,403	18.1%	
5632	Women's accessory & specialty store	5,893	7,111	$17,634	31.9%	814
5651	Family clothing stores	50,332	62,629	$24,644	20.6%	1,248
5713	Floor covering stores	8,328	9,458	$33,500	23.1%	416
5734	Computer and software stores	19,590	29,505	$56,074	30.7%	2,470
5735	Record & prerecorded tape stores	13,797	12,236	$20,147	56.5%	5,292
5810	Eating and Drinking Places	837,244	886,777	$12,881	19.4%	11,264
5921	Liquor stores	11,262	10,153	$16,213	26.7%	968
5947	Gift, novelty, and souvenir shops	23,572	27,720	$18,312	30.8%	2,991
5961	Catalog and mail-order houses	13,750	16,074	$40,873	55.3%	5,116
5963	Direct selling establishments	9,979	9,610	$22,252	29.0%	1,085

Finance, Insurance & Real Estate (FIRE)

Six sub-FIRE industries account for almost 31 percent of employment in FIRE, in 1999. Increased automation in banking has probably contributed to the reduction in employment levels in national commercial banks, six percent between 1996-1999, with the increase in average wages due to retention of higher priced staff and the lay-off of the lower paid Tellers. The employment increase of almost 24 percent in security brokers and dealers, coupled with a wage increase of 39 percent, is most certainly due to the increased stock market activity characterizing the latter half of the 1990s.

Table H: Finance, Insurance & Real Estate

SIC	SIC Title	Empl-1996	Empl-1999	Average Wage1999	Wage Change 1996-99	SI 96-99
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
6000	Finance, Insurance & Real Estate	732,275	817,424	$54,709	26.3%	
6021	National commercial banks	94,391	88,964	$46,763	30.6%	4,010
6211	Security brokers and dealers	35,412	43,718	$147,404	38.9%	4,444
6221	Commodity contracts brokers, dealer	376	1,063	$248,902	328.2%	1,135
6531	Real estate agents and managers	100,426	114,954	$39,445	26.8%	417
6794	Patent owners and lessors	3,754	3,864	$96,218	75.9%	1,860
6799	Investors, nec	1,955	2,535	$129,921	50.3%	469

Services

Thirty-five sub-services industries account for almost 33 percent of employment in services. Overall, this industry experienced an employment increase of over 13 percent between 1996 and 1999. Two of the large computer related industries (computer programming services and prepackaged software) experienced a combined 12 percent increase. Computer related services, nec also had huge increases – 76 percent. As shown by Table I, other high growth sectors within the services division included detective and armored car services, skilled nursing care facilities, and engineering services. Rooming and boarding houses, prepackaged software, information retrieval services, and motion picture distributors posted highest wage gains during this period.

Table I: Service

SIC	SIC Title	Empl-1996	Empl-1999	Average Wage1999	Wage Change 1996-99	SI 96-99
0000	Total	11,070,306	12,231,150	$37,310	19.6%	
7000	Services	3,845,859	4,347,970	$36,885	16.0%	
7011	Hotels and motels	174,225	187,108	$20,027	17.0%	1,686
7021	Rooming and boarding houses	1,364	1,057	$18,350	43.5%	375
7216	Dry-cleaning plants, except rug	12,240	11,348	$16,811	19.9%	475
7221	Photographic studios, portrait	8,414	7,608	$19,226	30.4%	1,212
7291	Tax return preparation services	6,810	7,011	$18,785	22.1%	415
7311	Advertising agencies	22,466	25,552	$67,133	22.4%	1,449
7322	Adjustment & collection services	7,931	10,152	$35,681	25.0%	719
7334	Photocopying & duplicating services	14,283	15,937	$27,555	18.9%	419
7342	Disinfecting & pest control service	15,503	14,129	$30,403	26.3%	1,602
7353	Heavy construction equipment rental	8,145	10,143	$46,688	27.0%	895
7361	Employment agencies	65,734	49,723	$28,610	31.6%	10,243

7371	Computer programming services	52,971	82,464	$85,562	29.2%	6,976
7372	Prepackaged software	43,102	58,076	$110,728	51.3%	15,220
7375	Information retrieval services	7,925	35,564	$107,321	112.1%	7,621
7379	Computer related services, nec	28,152	49,521	$80,766	32.5%	4,645
7381	Detective & armored car services	89,685	94,898	$17,703	22.1%	5,437
7382	Security systems services	7,951	9,006	$34,575	26.3%	823
7389	Business services, nec	132,343	123,371	$32,558	22.0%	8,017
7542	Carwashes	20,643	23,718	$13,235	21.3%	1,094
7822	Motion picture and tape distribution	4,947	3,381	$76,561	44.7%	1,420
7829	Motion picture distribution service	4,904	610	$113,996	136.5%	5,910
7841	Video tape rental	16,162	19,279	$11,368	19.7%	595
7911	Dance studios, schools, and halls	3,452	3,431	$11,893	33.3%	597
7991	Physical fitness facilities	27,798	32,630	$13,407	24.4%	2,352
7996	Amusement parks	23,221	25,592	$19,968	20.2%	989
7999	Amusement and recreation, nec	51,910	54,759	$18,915	24.7%	4,530
8051	Skilled nursing care facilities	93,139	103,738	$21,151	16.4%	415
8641	Civic and social associations	40,999	41,587	$16,127	17.7%	704
8711	Engineering services	82,453	89,120	$62,855	18.1%	1,771
8712	Architectural services	17,308	22,629	$56,709	19.2%	558
8721	Accounting, auditing, & bookkeeping	76,952	81,285	$49,402	23.8%	5,976
8731	Commercial physical research	49,282	45,508	$76,726	17.9%	930
8733	Noncommercial research organization	21,372	25,575	$51,874	21.7%	1,220
8741	Management services	64,636	47,487	$54,373	23.3%	4,755
8742	Management consulting services	34,061	32,428	$68,002	28.9%	4,399

Conclusions and Future Research

The proposed indicator of labor supply shortages seems to have proven useful in identifying industries that experienced labor shortages in the 1990s. The indicator reflects many aspects of the California economy and labor markets in the 1990s. Although the indicator is perhaps confounded by trends in compensation (for example, stock option withdrawals, and the replacement of wage increases with added benefits), it appears to have accurately reflected labor market conditions in many known cases and may very well be used to monitor labor supply shortages for different sectors of the economy. Nevertheless, data sets available from other administrative and non-administrative sources such as program completers, Local Employment Dynamics (LED)[6], and employers' reported difficulties in recruitment[7] might add value to this analysis.

In the second phase of this research, we plan to adopt a holistic approach to supply-demand analysis by identifying and examining several different data sources and analytical tools available to labor market analysts. In partnership with the National Occupational Supply-Demand (OSDS) Consortium, we will continue making strides toward developing and evaluating the feasibility of a web-based product for a complete supply-demand analysis of industry and occupational employment to assist with training and education program planning. Using data on industry and occupational employment,

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[6] http://lehd.dsd.census.gov/led/datatools/qwiapp.html

[7] The California LMID, with advice from local workforce training providers and others, surveys employers to collect occupational information for local areas. The local area specific reports contain a wide array of occupational information, including: wages and benefits, work activities, education and training needed, annual job openings, and demand for and availability of qualified workers

wages, program completers, and the employer reported difficulty in recruiting qualified workers; the envisaged framework would employ a systematic approach to identify industries and occupations that may indicate labor or skill shortages.

This collage of evidence, is indicative of probable skill shortages especially in industries and occupations that are also projected to grow at the fastest rate in the next decade of so. It would be extremely helpful for education and training planners to redirect resources in order to meet the skilled labor force needs in the 21st century.